SIEMENS

CU230P-2 Control Units

Getting Started

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1 Warning and safety information

General information

⚠ WARNING

These devices are at hazardous voltage levels and control rotating mechanical parts, which in some circumstances, can be dangerous. Non-observance of the warnings or non-compliance with the instructions in this manual can lead to danger to life, serious injury or substantial damage to property.

Only qualified personnel who have previously familiarized themselves with all the instructions regarding safety, installation, operating and maintenance as set out in this manual are permitted to work on these devices. Successful and safe operation of these devices depends on their proper mounting, operation and maintenance.

The line supply, direct current and motor terminals as well as the brake and thermistor cables are at hazardous voltage levels even when the inverter is out of service. Once the power supply has been disconnected, wait at least 5 minutes until the device has discharged itself. Only then can you start the installation work.

Since the fault current for this product can be greater than 3.5 mA AC, a fixed ground connection is required and the minimum size of the protective conductor must comply with local safety regulations for equipment with a high leakage current.

It is strictly prohibited for any mains disconnection to be performed on the motor-side of the system; any disconnection of the mains must be performed on the mains-side of the inverter.

Before the inverter power supply is connected, it must be ensured that the motor terminal box is closed.

If an LED or similar indicator does not light up or is not active when a function is switched from ON to OFF, this does not mean that the unit has been switched off or is current-free.

The inverter must always be properly grounded.

The device must be isolated from the power supply before any connections at the device are established or changed.

Make sure that the inverter has been configured for the correct supply voltage. The inverter must not be connected to a higher supply voltage.

The general and regional installation and safety regulations for working on equipment at high hazardous voltage levels (e.g. EN 50178) as well as the relevant stipulations regarding the correct use of tools and personal protective equipment (PPE) are especially to be observed.

⚠ CAUTION

Children and other unauthorized persons must be forbidden from accessing the devices!

It is only permissible to use these devices for the purpose specified by the manufacturer. Unauthorized changes and the use of spare parts and accessories which are not sold or recommended by the manufacturer of the device can lead to fires, electric shock and injuries.

NOTICE

This manual is to be kept somewhere close to the devices and must be easily accessible for all users.

If measurements or tests have to be carried out on the live device, the stipulations of safety regulation BGV A2 are to be complied with, especially § 8 "Permissible deviations during work on live parts". Suitable electronic tools are to be used.

Before mounting and commissioning, please read these safety instructions and the warnings carefully as well as the warning labels on the devices. It must be ensured that the warning labels are always legible; any signs that are damaged or missing are to be replaced.

Make sure that suitable circuit breakers/fuses (with the specified rated currents) are installed between the line supply and the inverter.

The manual is intended for users who have experience in handling the following equipment:

- PLCs
- STARTER commissioning software
- PROFIdrive profile and protocols.

The commissioning instructions in this manual only apply to standard inverters. The fail-safe commissioning is described in the operating instructions.

2 Documentation for additional support

Commissioning using "Getting Started"

Getting Started describes how you can perform basic commissioning with either STARTER or using the IOP. For special inverter functions such as e.g. automatic restart or flying restart, please use the operating instructions, the Function Manual and the parameter list.

The functions and properties of the IOP are described in detail in the "SINAMICS IOP" operating instructions and are only explained here to an extent that is necessary to understand the described functions.

Collection of manuals for standard drives

The collection of manuals for standard drives is an extensive compilation of all documents relating to inverters, motors and geared motors. It can be ordered as DVD and can run under all Windows versions.

Order No.: 6SL3298-0CA00-0MG0

Online documentation

In the Internet, the documentation for standard drives is available as PDF under the following link:

Online documentation for standard drives (http://support.automation.siemens.com/ww/view/en/4000024)

Generic station description files (GSD)

The generic station description files (GSD) for the standard drives are available in the Internet under the following link:

Generic station description files (http://support.automation.siemens.com/WW/view/en/23450835)

GSDs are required to integrate inverters into control systems (e.g. SIMATIC S7).

3 Installation

CU230 field of application

The CU230P-2 is a Control Unit that has been optimized for pumps and fans. It can be operated with all power units of the PM240 and PM250 series.

The following versions of CU230P-2 are available:

- CU230P-2 HVAC with RS485 interface for USS and Modbus RTU
- CU230P-2 CAN with CANopen interface
- CU230P-2 DP with PROFIBUS DP interface

They can be commissioned either using the STARTER commissioning software or using the optional IOP operator panel (Intelligent Operator Panel).

You can save all the settings you enter during commissioning and operation to a memory card.

3.1 Interfaces, connectors, control terminals and LEDs on the CU

Overview

The CU controls the inverter functions. It cannot be used without a Power Module (PM) - just the same as a PM cannot be used without a CU.

⚠ WARNING
Inverters are at hazardous voltage levels and control the speed and direction of rotation of motors. This is the reason that only trained personnel may commission the inverters.

Factory setting for command and setpoint sources

CU230P-2 HVAC and CU230P-2 CAN:	Terminals	(p0700 = p1000 = 2)
CU230P-2 DP:	Fieldbus	(p0700 = p1000 = 6)

The command and setpoint sources can be changed using p0700, or p1000.

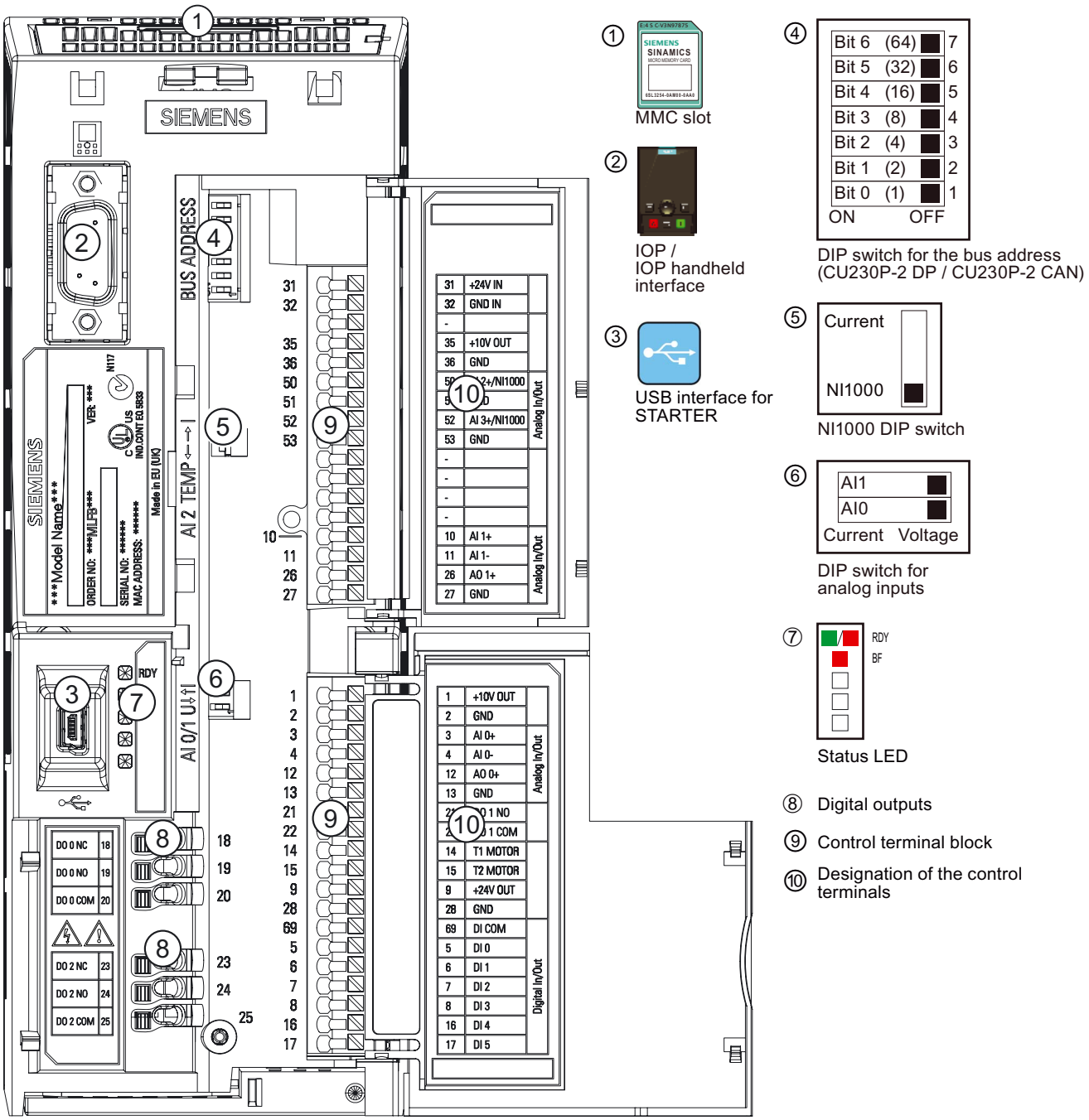
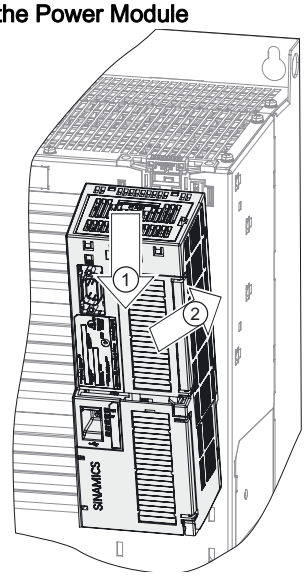


Figure Control Unit CU230P-2, doors open

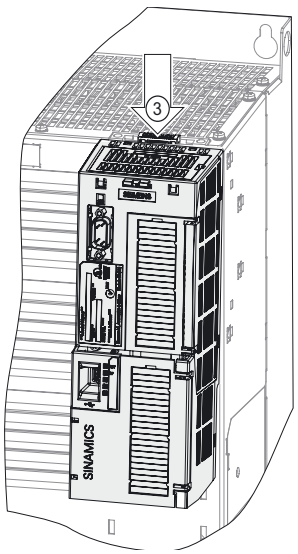
3.2 Snap the Control Unit onto the Power Module

Snap the Control Unit onto the Power Module

Plug the Control Unit onto the Power Module as shown. All the necessary electrical connections are made between the two components.



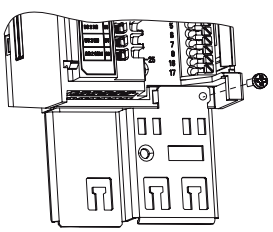
If you want to remove the Control Unit, press the unlatching button on the Power Module ③. You can then tilt the Control Unit forwards and remove it from the Power Module.



Screening kit for the Control Unit

A screening kit is available for the Control Unit. This allows easy bonding of control cable shields for connection to the Control Unit potential. The set must be attached to the Control Unit by means of an M3 screw (supplied with the kit).

Regardless of whether or not a shield connection kit is used, the Control Unit is connected to the reference potential of the Power Module as soon as it is snapped onto the module.



Retain the shield connection kit

⚠ WARNING

If 230 V relays are controlled from the digital outputs DO0 and DO2, then these must always be switched into a no-voltage condition before the Control Unit is removed from the Power Module. The reason for this is that when the Control Unit is removed, the connection to the protective conductor is interrupted.

3.3 Control terminals of the Control Units

Arrangement and functions of the control terminals on the CU230P-2 Control Units

All Control Units have the same control terminals. The factory presettings for certain terminals differ, however, depending on the CU variant.

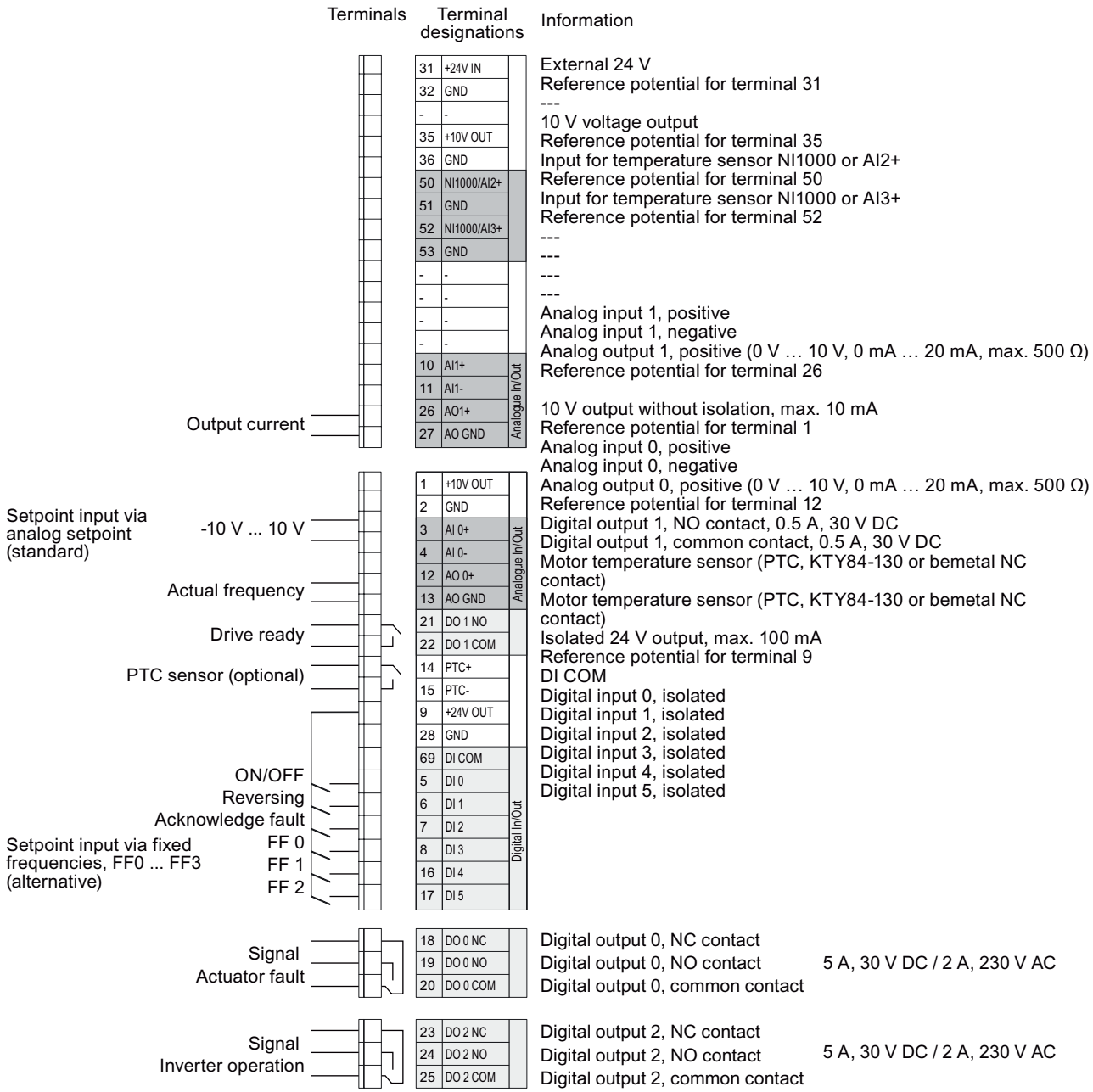


Figure Control terminals with pre-assignment

3.4 Connecting the CU230P-2 HVAC via the RS485 interface

Description

This section describes how the inverter is physically connected to a serial bus system over the RS485 interface. The communication settings are described in the Control Unit operating instructions in the sections "Communication over USS" and "Communication over Modbus RTU".

The Control Unit has a two-part terminal strip underneath the Control Unit which allows the inverter to be integrated into a serial bus system over the RS485 interface. This connector has short-circuit-proof, isolated pins. You will find the terminal assignments in the following table.

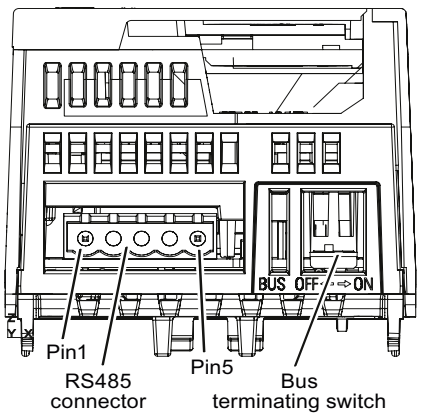


Table 1 Assignments for the terminal strip of the RS485 interface

Contact	Designation	Description
1	0 V	Reference potential
2	RS485P	Receive and send signal (+)
3	RS485N	Receive and send signal (-)
4	Shield	Cable shield
5	---	---

Communication settings

Baud rate p02020	**USS**	4 = 2400 9 = 57600	5 = 4800 10 = 76800	6 = 9600 11 = 93750	7 = 19200 12 = 115200	8 = 38400 13 = 187500
	Modbus RTU		5 = 4800	6 = 9600	7 = 19200	
Address p2021	**USS**	0 … 30, factory setting = 8, maximum 31 Slaves				
	Modbus RTU	1 … 247, factory setting = 7, maximum 247 Slaves				

Maximum cable length 1200 m (3281 ft)

General specifications and requirements for fault-free communication

NOTICE
When the bus is operating, the first and last bus station must be continuously connected to the supply.

Note

Communication with the controller, even when the supply voltage on the Power Module is switched off

You will have to supply the Control Unit with 24 V DC on terminals 31 and 32 if you require communication to take place with the controller when the line voltage is switched off.

For the first and last stations, you must connect the bus terminating resistor using the DIP switches to the right of the RS485 terminal strip.

You can disconnect one or more slaves from the bus (by unplugging the bus connector) without interrupting the communication for the other stations, but not the first or last.

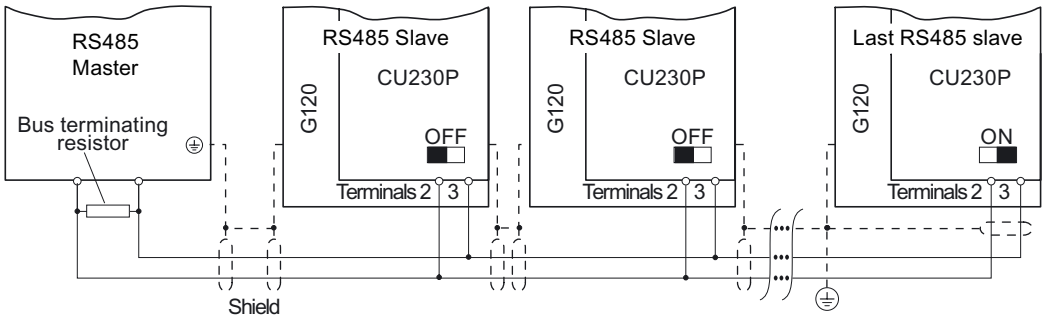


Figure Communication network via RS485

Note

For Modbus RTU

Two 100-kΩ resistors are provided for polarizing the A&B cable.

3.5 Connecting CU230P-2 DP to the PROFIBUS DP network

Description

This section describes how the inverter is physically connected to a PROFIBUS DP bus system. The communication settings are described in the Control Unit operating instructions in the section "Communication over PROFIBUS DP".

The Control Unit CU230P-2 DP has a 9-pin sub D connector to the PROFIBUS standard underneath the Control Unit for integrating the inverter into the PROFIBUS DP fieldbus system. This connector has short-circuit-proof, isolated pins. You will find the pin assignments in the following table.

Note: The PROFIBUS modules do not have any integrated bus terminating resistors.

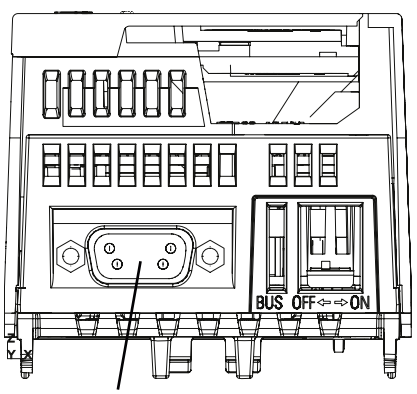
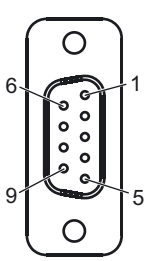


Table 2 Pin assignments for the 9-pin sub D connector (socket)

	Contact	Designation	Description
	1	PE / shield	Ground connection
	2	---	---
	3	DPB	Data P receive/transmit (B/B')
	4	RTS	Control signal
	5	0 V	Reference potential for PROFIBUS data (C/C')
	6	5V	Supply voltage plus
	7	---	---
	8	DPA	Data N receive/transmit (A/A')
	9	---	---
	Enclosure	PE / shield	Cable shield

PROFIBUS DP cable connector and permissible cable lengths

For connecting the SINAMICS G120 inverter, we recommend the following PROFIBUS DP cable connectors:

- 6GK1 500-0FC00
- 6GK1 500-0EA02

They are equipped with a switch through which the bus terminating resistor can be connected.

Permissible cable lengths

The permissible cable lengths are dependent on the baud rate and the PROFIBUS cable. For further information, please referto: (http://support.automation.siemens.com/WW/view/en/22698508)

Note

Communication with the controller, even when the line voltage is switched off

You will have to supply the Control Unit with 24 V DC on terminals 31 and 32 if you require communication to take place with the controller when the line voltage is switched off.

Setting the PROFIBUS DP address

Before the PROFIBUS DP interface is used, the address of the node point (inverter) must be set.

The following methods are available for setting the PROFIBUS DP address:

- Using the address switch on the Control Unit
- Using parameter p0918

Note

Important notes for setting the PROFIBUS address

The address setting on the DIP switch takes priority over the p0918 settings.

The PROFIBUS DP address can only be set using p0918 when the address 0 is set on the DIP switches of the Control Unit (factory setting). When the address switch is set to a value ≠ 0, the setting in p0918 is ignored.

Valid address range for Siemens controllers: 1 … 125.

Arrangement of the DIP switches on the Control Unit and address examples

The arrangement and the values of the individual DIP switches to set the Profibus address are provided in "Interfaces, connectors, control terminals and LEDs on the CU (Page 3)

Note

A newly set PROFIBUS DP address will only come into effect after switching off and on again. It is particularly important that any external 24 V supply is switched off.

3.6 Connecting CU230P-2 CAN to CAN bus

Description

This section describes how the inverter is physically connected to the CAN bus. The communication settings are described in the Control Unit operating instructions in the section "Communication settings for CANopen".

The Control Unit CU230P-2 CAN has a 9-pin sub D connector underneath the Control Unit for integrating the inverter into the CANopen fieldbus system. This connector has short-circuit-proof, isolated pins. You will find the pin assignments in the following table.

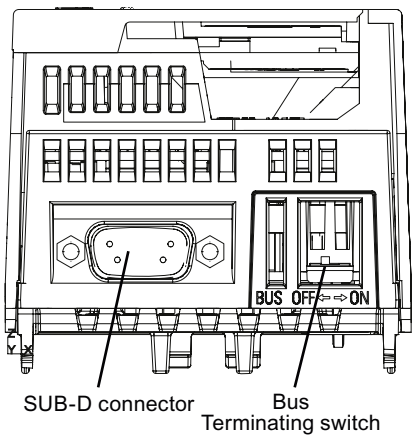
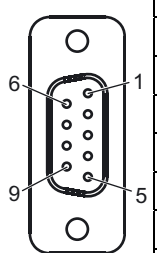


Table 3 Pin assignments for the 9-pin sub D connector (socket)

	Contact	Designation	Description
	1	Reserved	---
	2	CAN_L	CAN signal (dominant low)
	3	CAN_GND	CAN ground
	4	Reserved	---
	5	(CAN _SHLD)	Optional shield
	6	(GND)	Optional CAN ground
	7	CAN_H	CAN signal (dominant high)
	8	Reserved	---
	9	ISO	5 V

CANopen cable connector

For setting up a CANopen network, you can use cable for serial 9-pin connections with sub D connectors.

General specifications for CANopen and requirements for fault-free communication

NOTICE
When the bus is operating, the first and last bus station must be continuously connected to the supply.

Note

Communication with the controller, even when the line voltage is switched off

You will have to supply the Control Unit with 24 V DC on terminals 31 and 32 if you require communication to take place with the controller when the line voltage is switched off.

Setting the CANopen address

In order to integrate an inverter into a CANopen network, you need to set the address. The following possibilities exist:

- Using the address switch on the Control Unit
- Via parameter p8620

Note

Important note for setting the CANopen address

The address can only be set via p8620 if the address 0 or 127 is set on the DIP switches of the Control Unit. If the address switches are set to a value ≠ 0 or 127, this address is always active and p8620 is read-only.

Arrangement of the DIP switches on the Control Unit and address examples

The arrangement and the values of the individual DIP switches to set the CANopen address are provided in "Interfaces, connectors, control terminals and LEDs on the CU (Page 3)

Note

A newly set CANopen address will only come into effect after switching off and on again. It is particularly important that any external 24 V supply is switched off.

For additional information, please refer to the associated operating instructions:

4 Commissioning

Description

Commissioning must have been completed before a motor can be operated at the inverter (Control Unit and Power Module).

To do this, proceed as follows:

- Commission the drive using either IOP or STARTER
- Download a valid parameter set via
  - Memory card
  - IOP
  - STARTER

Further, the following prerequisites must be fulfilled to operate a motor from an inverter:

- The rated inverter current must, as a minimum, be just as high as that of the motor.
- The motor power should match that of the inverter, however, motors can be operated in the power range from 25 % … 100 % of the inverter power rating.

Installation checklist

Before you apply the voltage, check whether you have performed the following steps and whether the necessary conditions are met.

	Check item	✓
1	The ambient conditions specified for the motor and inverter have been complied with.	
2	The inverter and motor are firmly installed.	
3	The inverter and motor are correctly installed and the cooling measures are sufficient.	
4	The motor and the associated application are ready for operation, i.e. in a safe state, the motor can rotate.	
5	The inverter is correctly grounded.	
6	The supply voltage corresponds to the input voltage of the inverter.	
7	The line fuses meet requirements and are correctly installed.	
9	The motor and line connections are established and tightened according to guidelines.	
10	The direction of rotation of the motor has been checked without it coupled to a machine - an incorrect direction of rotation can result in serious material damage.	
11	The motor cable is routed separately away from other cables (if required, shielded motor and control cables should be used).	
12	Control connections must be established corresponding to the regulations.	
13	Tools or other objects that could cause damage to the system have been removed.	
14	The inverter is the only current source for the motor.	

4.1 Commissioning with STARTER

Prerequisites and preparations for commissioning with STARTER

- STARTER has been installed on the commissioning PC
  STARTER can be ordered under Order No. 6SL3072-0AA00-0AG0 as DVD or can be updated to the latest version from the Internet under the following link (http://support.automation.siemens.com/WW/view/en/10804985/133100). Further, the SINAMICS G120 PC - inverter connection kit - 2 (USB cable and STARTER DVD) is available under Order No. 6SL3255-0AA00-2CA0.
- The computer is connected to the inverter, e.g. via the USB cable and the USB driver (supplied with the Control Unit) has been installed
- The inverter power supply has been switched on.
- The STARTER commissioning software has been started.
  The online help also opens in the factory setting. If you proceed according to the description provided in Getting Started, you can close the online help. If you wish to avoid that the online help is displayed each time the system starts, in the "Options/Settings" dialog screen form, you can make the appropriate settings under the "Workbench" tab.

Commissioning is subdivided into the following steps.

- Creating a STARTER project
- Go online with the inverter
- Starting commissioning

4.1.1 Connecting up the inverter for commissioning via STARTER at a PC

Description

This section describes how to connect up the inverter via the USB interface for commissioning with STARTER. The USB interface is located at the front of the Control Unit.

A Mini-B 5-pin connector is required for the USB interface at the inverter.

Note

If no IOP is inserted, then a connection to the PC can be established using the free RS232 interface.

You cannot use both interfaces at the same time.

4.1.2 Installing USB drivers

Description

If you connect your inverter to your PC for the first time via the USB interface, you will be prompted by the following screen to install the driver for the SINAMICS G120 Control Unit.

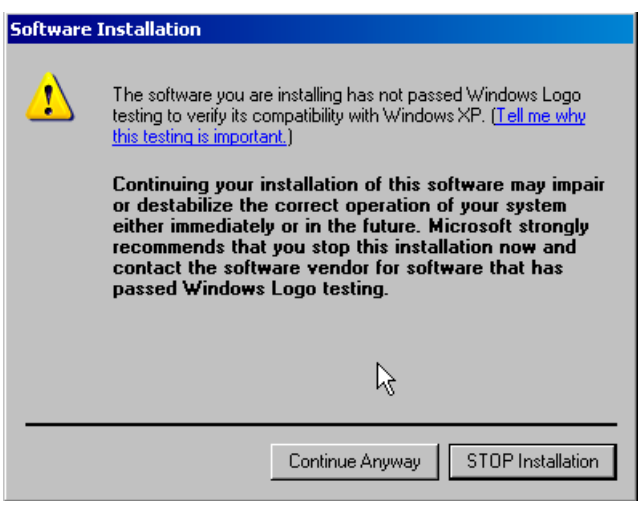
Insert the driver CD supplied with the CU into the CD-ROM drive.

Before installation, read the license conditions. These are saved on the CD under the "License.txt" name.

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
This wizard helps you install software for:
Sinamics G120 Bridge Driver
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

Then click on "Next" and select "Continue Anyway" in the adjacent screen.

Installing the driver does not have any negative impact on your computer.

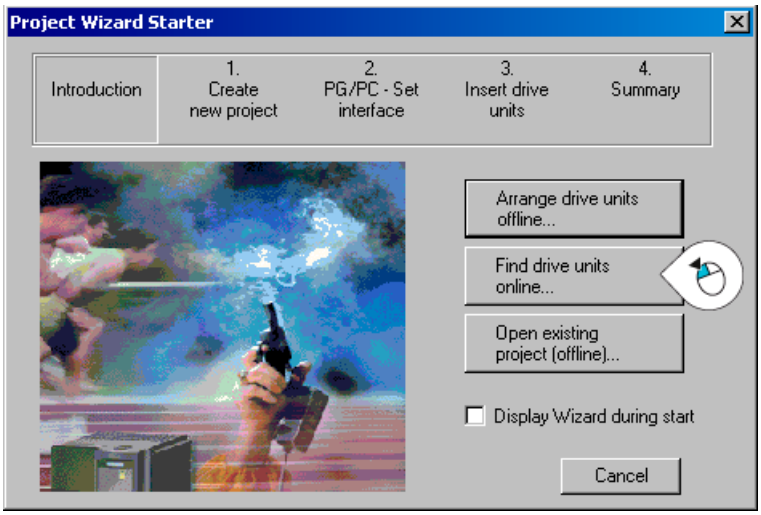

Software Installation
The software you are installing has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the software vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation

The driver has now been installed and you can start to create a STARTER project.

4.1.3 Creating a STARTER project

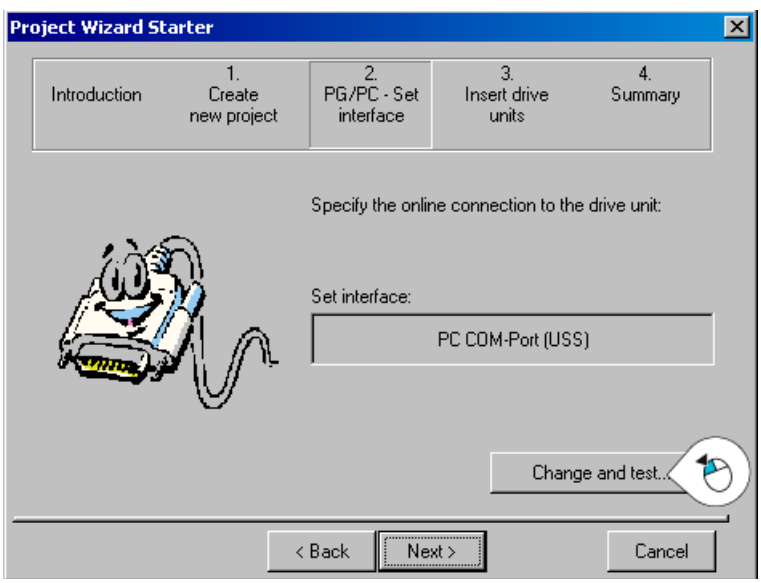
Create a STARTER project using the Project Wizards

Start the Wizards (Project/New with wizard) and search, as shown in the adjacent diagram, for the inverters connected to the PC.



In the next window (not shown here), enter a descriptive project name and if required, also a comment.

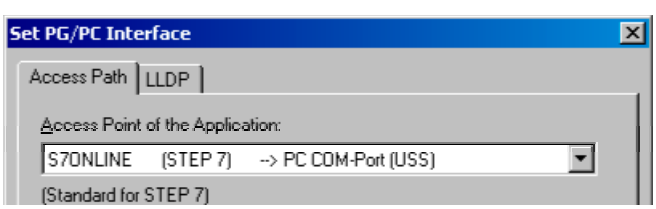
Click on "Next" and the adjacent dialog box is displayed from where you can configure the PC interface.

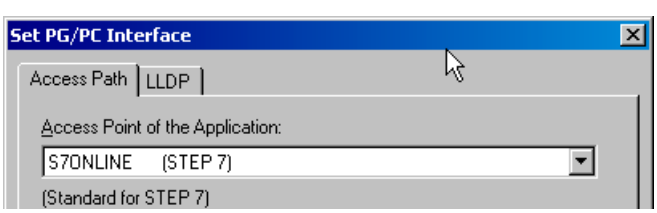


Setting the PC interface

If the Access Point "S7ONLINE (STEP7)" is connected to "PC COM-Port (USS)" (①), then you can continue with the following section. Otherwise, install the "PC COM-Port interface" as it is described in Section Installing the COM interface (Page 30).

①





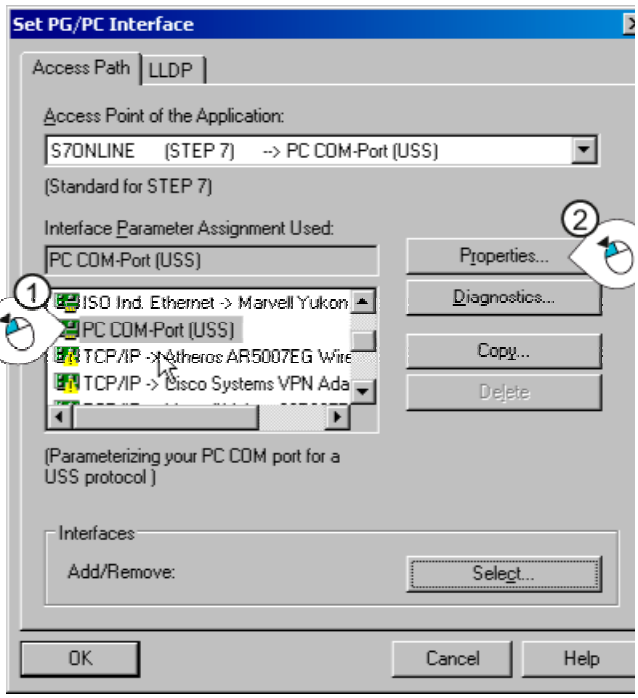
You will require the number of the COM connection to continue setting the PC interface.

A description is provided in Section Setting the COM interface (Page 31) as to how you can read this from the control panel and if required, change it.

To set the PC interface, in the adjacent screen, select the "PC COM-Port (USS)" interface (①) and click on "Properties" (②).

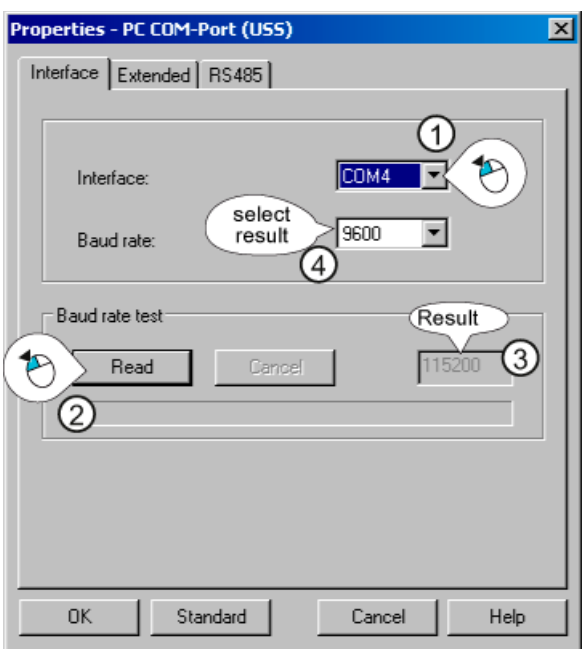
In the following dialog box, select the number of the COM connection that you defined in the Section "Setting the COM interface" (①).

Note: The number of the COM interface must be less than 8 (COM1 … COM7).

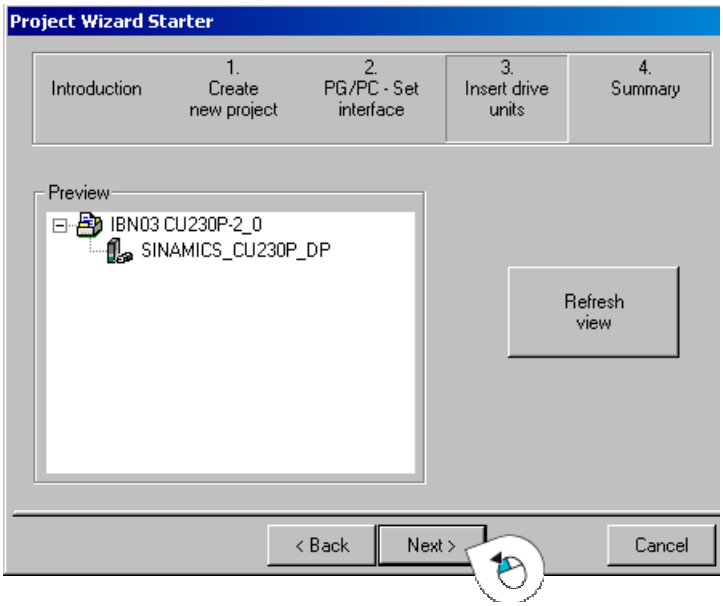


Using "Read" (②) check the baud rate that has been selected and select the result (③) using the select box for the baud rate (④).

In addition, select "Automatic mode" under the "RS485" tab. This means that the PC interface has been set and you return to the Project Wizards with "OK". If you press the "Next" button there, then STARTER searches for the inverters connected to the PC via the USB interface.



In this window, press the "Continue" button - a dialog box is displayed with a summary of the settings that you made. Close the Project Wizards using the "Finish" button and then you can continue with the remaining commissioning steps.

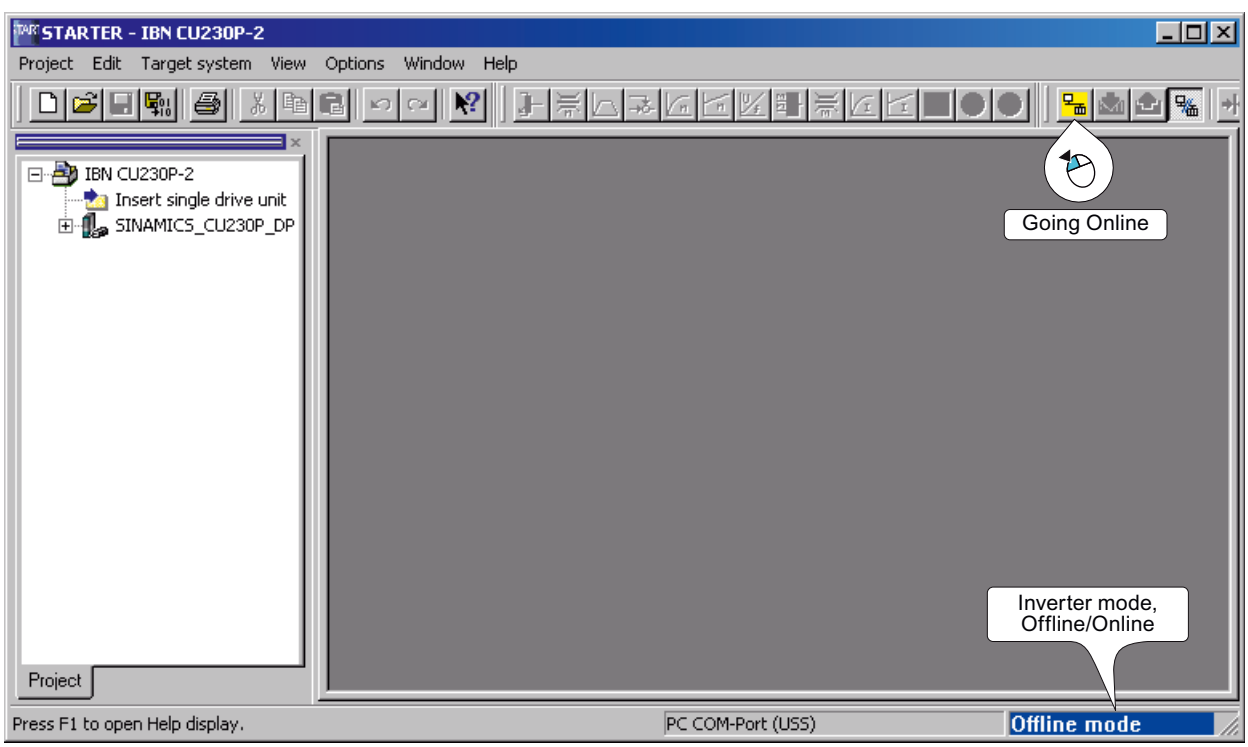


4.1.4 Go online with the inverter

Description

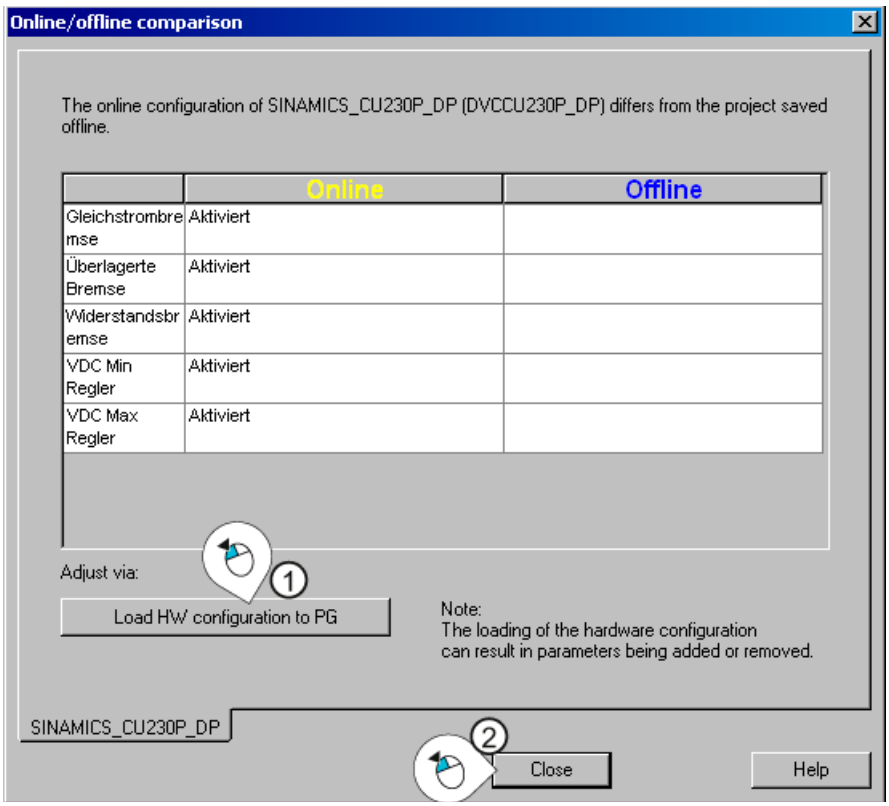
When the Project Wizards are exited, the project is set-up under the specified path and is simultaneously opened.

The following screenshot shows which button you must press to directly access the inverter data via STARTER (going online).



If the data that are saved in STARTER for the inverter involved (offline data) are different from those of the inverter (online data), then the adjacent screen is displayed.

First, press the "Load HW configuration to PG" button to overwrite the offline data with the data of the inverter and then the "Close" button and proceed with the commissioning.



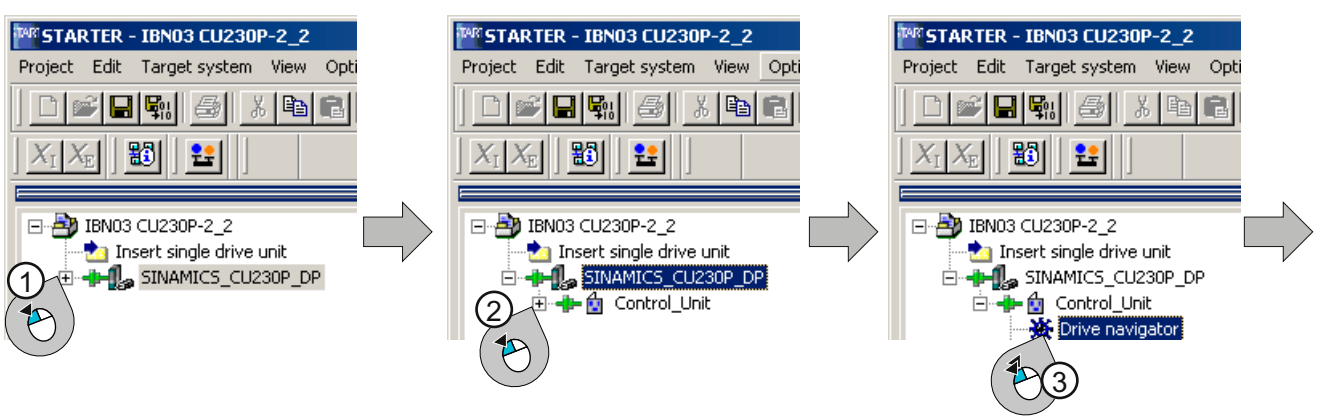
Note

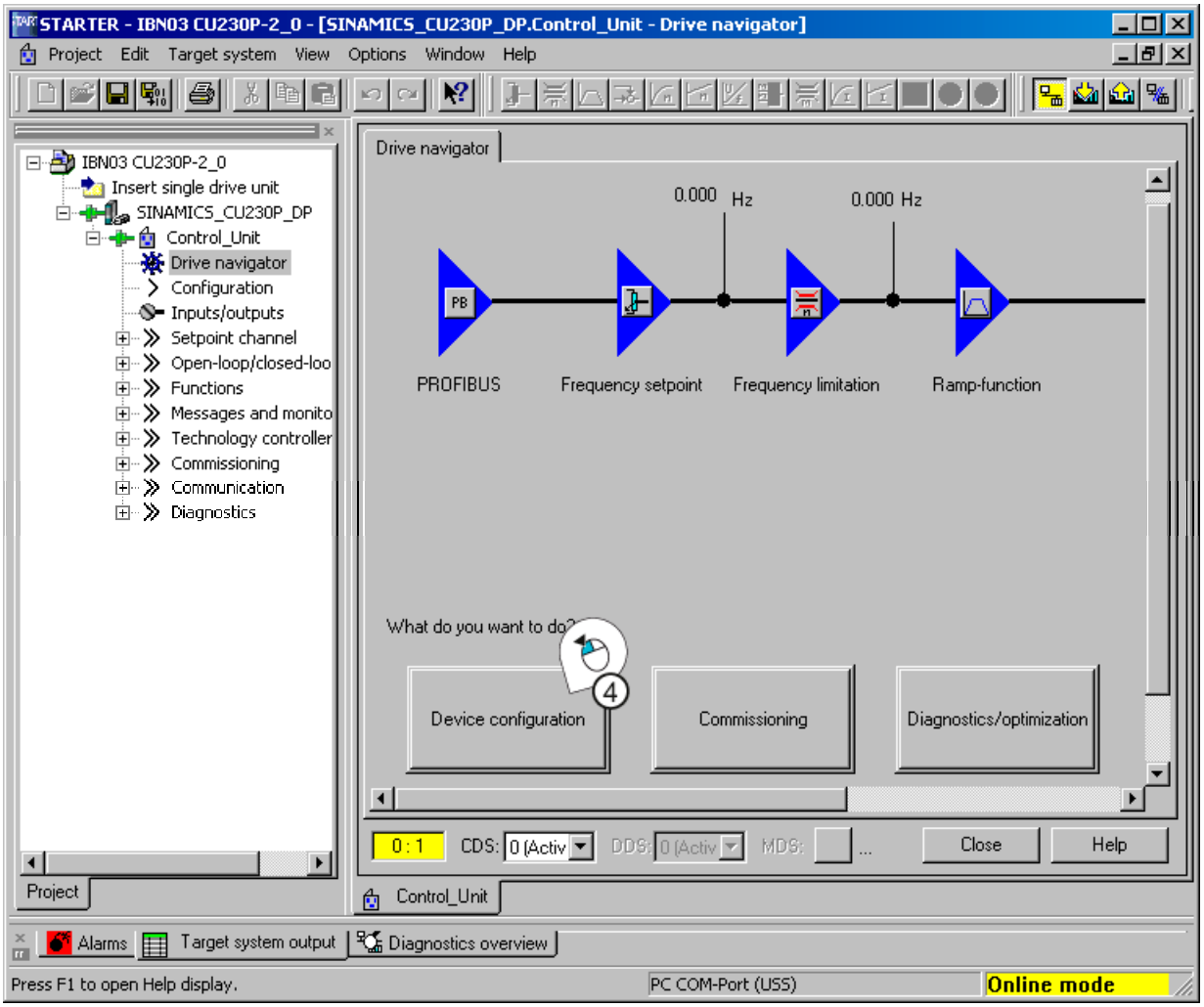
If you first press the "Close" button, then the online connection is terminated before any data has been changed.

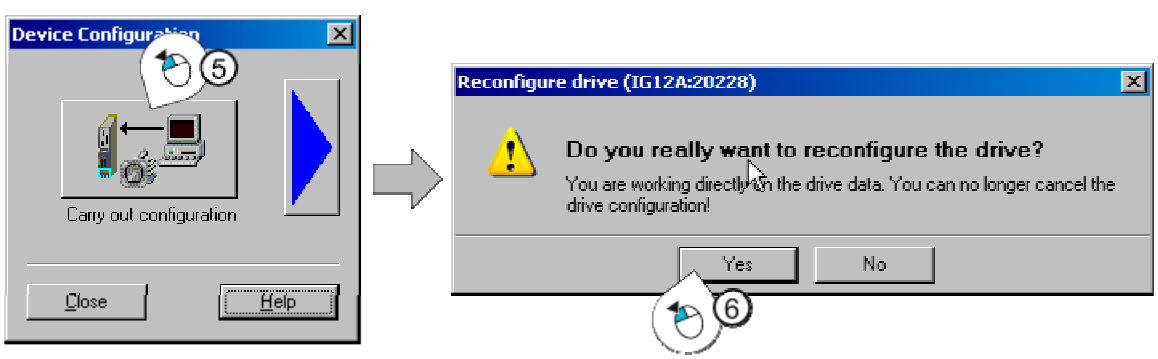
4.1.5 Start commissioning

Description

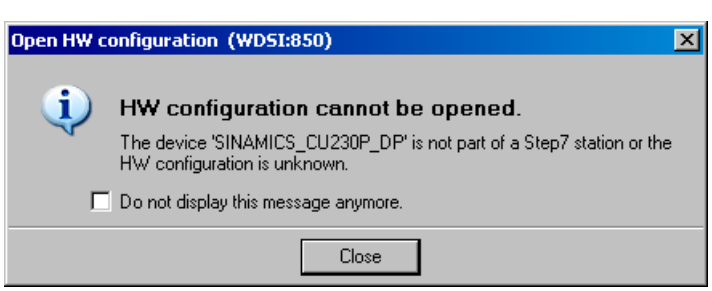
After you have gone online, open the commissioning dialog box with the following steps:







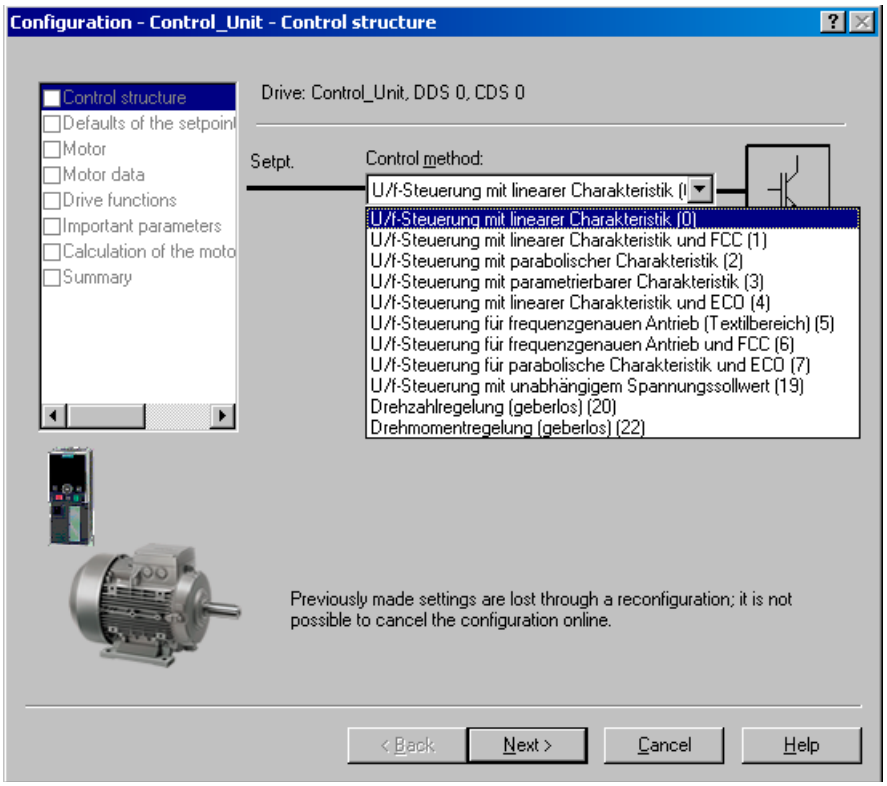
The following message could be displayed if your inverter is not part of a SIMATIC control. This has no significance when commissioning the inverter and can be closed.


Open HW configuration (WDSI:850)
HW configuration cannot be opened.
The device 'SINAMICS_CU230P_DP' is not part of a Step7 station or the HW configuration is unknown.
Do not display this message anymore.
Close

4.1.6 Carrying out commissioning

Description

The Commissioning Wizard starts with the screen form to set the closed-loop control. Using the drop-down menu, select one of the listed open-loop or closed-loop control types and click on "Continue".


Configuration - Control_Unit - Control structure
Control structure
Defaults of the setpoint
Motor
Motor data
Drive functions
Important parameters
Calculation of the moto
Summary
Drive: Control_Unit, DDS 0, CDS 0
Setpt.
Control method:
U/f-Steuerung mit linearer Charakteristik (
U/f-Steuerung mit linearer Charakteristik (0)
U/f-Steuerung mit linearer Charakteristik und FCC (1)
U/f-Steuerung mit parabolischer Charakteristik (2)
U/f-Steuerung mit parametrierbarer Charakteristik (3)
U/f-Steuerung mit linearer Charakteristik und ECO (4)
U/f-Steuerung für frequenzgenauen Antrieb (Textilbereich) (5)
U/f-Steuerung für frequenzgenauen Antrieb und FCC (6)
U/f-Steuerung für parabolische Charakteristik und ECO (7)
U/f-Steuerung mit unabhängigem Spannungssollwert (19)
Drehzahlregelung (geberlos) (20)
Drehmomentregelung (geberlos) (22)
Previously made settings are lost through a reconfiguration; it is not possible to cancel the configuration online.
< Back
Next >
Cancel
Help

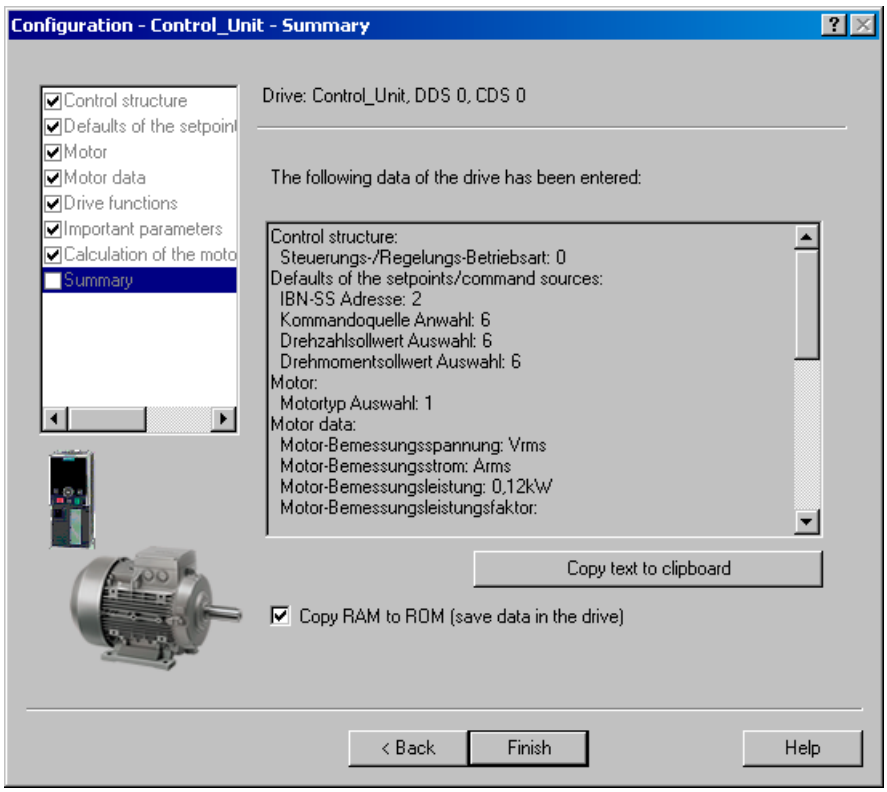
Screen forms then follow one after the other for

- Setpoint and command sources
  Note: For **CU230P-2 DP** CUs, the PROFIdrive telegram must be changed to 999 before the command and setpoint sources can be changed.
- Motor type
- Motor data
- Drive functions

  For the drive functions, the motor data identification type can be selected. We recommend that the motor data identification is always carried out with the motor at a standstill. Whether the rotating measurement can be carried out depends on the application (e.g. direction of rotation, distance limits) and must be decided depending on the particular plant.

  The motor data identification starts with the first ON command after commissioning.
- Important parameters (e.g. max. and min. speed or ramp-up and ramp-down time)
- Calculating the motor data
- Summary

  This screen form allows the settings that have been made to be permanently saved in the inverter (☑ Copy RAM to ROM (save data in the drive)) and in addition, to save them in a text file via the buffer. The device configuration is completed with "Finish".



The next ON command starts the motor data identification. This completes the first commissioning.

4.2 Restoring the factory settings using STARTER

The inverter is reset to the delivery condition by restoring the parameters to the factory setting.

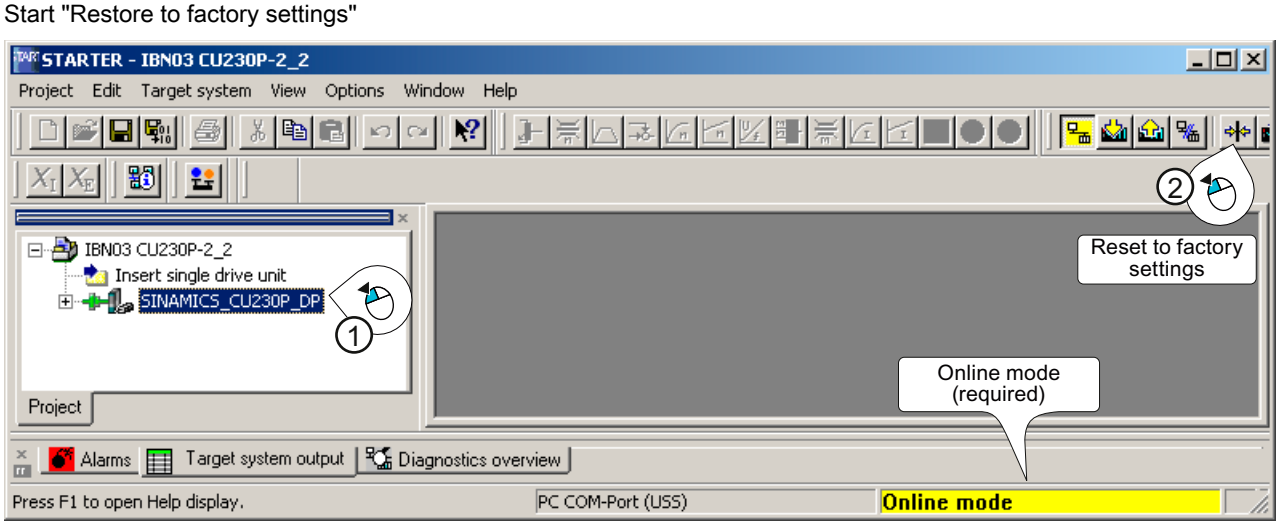
Note

The reset operation is not applied to parameters p0014, p0100, p0201, p0205 or the communication parameters. Motor parameters p0300 ... p0311 are suitably preassigned for the power unit.

The inverter must be in the online mode to "Restore factory setting". Communication with the control is interrupted for the time it takes to restore the factory settings.

Restoring the factory setting is done in the following steps:

- Select the inverter in the directory tree
- Start "Restore to factory settings"



4.3 Commissioning with the IOP

Description

Using a text and graphic display, the IOP offers the possibility of selecting Wizards for commissioning, function menus, e.g. for diagnostics or the status display. It has five function keys and a navigation wheel that is simultaneously used as the OK key. The IOP can also be used as handheld terminal.

The IOP display goes dark if a key is not pressed within 60 seconds. The display is re-activated if a key is pressed or the navigation wheel is turned.

Using the IOP, prompted commissioning is possible just the same as setting individual parameters or standard commissioning using parameter download.

Getting Started describes selecting the Commissioning Wizards and setting the setpoint input via the analog input or as fixed frequencies via three digital inputs using the basic commissioning Wizards.

You will find a detailed description of all IOP functions in the associated operating instructions.

Important IOP symbols

Manual/Auto
The symbol indicates whether operator control is realized using the IOP (Manual) or using the command and setpoint sources (Auto) that have been set for operation

Off / Operation / Fault
The inverter state is displayed using these symbols

Functions of the navigation wheel

- Selecting Wizards and menus by rotating
- Selecting Wizards and menus by pressing
- Changing values by rotating
- Accepting values by pressing

ON command for the inverter when using the IOP (Manual) for operator control, no function in the "Auto" operating mode.

OFF command for the inverter when controlled from the IOP (Manual)

- OFF 1 (deceleration along the ramp) when pressed normally,
- OFF2 (pulse inhibit) when pressed for longer than 3 seconds.

This has not function in the "Auto" mode.

If this key is briefly pressed, then the display goes to the data previously displayed. if this key is press for longer than three seconds, then the status display is shown. If the key is pressed when a numerical value is entered, the actual value is not accepted.

Switching over between operator control from the IOP and via the command and setpoint sources that have been set for operation

The information button provides additional information about the actual display.

Commissioning with the IOP

For commissioning, the IOP must either be directly plugged onto the Control Unit of the inverter or must be connected to it via the handheld enclosure. This therefore establishes all of the connections required.

Plug the IOP onto the inverter

After you have connected-up the Control Unit, locate the lower edge of the IOP, as shown in the diagram, onto the protruding lower section of the Control Unit (①) and snap the IOP (②) onto the Control Unit.

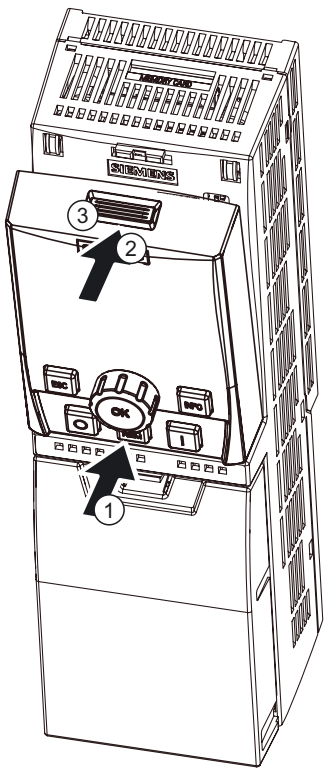
Removing the IOP from the inverter

By pressing the interlocking knob (③), you release the mechanical connection to the control module (Control Unit) and you can then remove the IOP.

The IOP can be inserted and removed also under voltage without any restrictions.

Prerequisites for commissioning using the IOP

- The IOP is plugged onto the inverter.
- The inverter power supply has been switched on.



4.3.1 Commissioning with the IOP

Description

When you plug the IOP onto the inverter for the first time, then it logs-on with the English welcome screen and then goes into the language selection menu.

Using the navigation wheel, select the language that you wish to use and acknowledge this by briefly pressing (OK or accept function). The IOP then changes into the status display (standard display of the IOP).

For commissioning, select the Wizards using the navigation wheel and acknowledge with OK.

For basic commissioning, you can select one of the following Wizards using the navigation wheel:

- Basic commissioning — General basic commissioning
- Open-loop controlled fan — Basic commissioning for a fan without control loop
- Closed-loop controlled fan — Basic commissioning for a fan with control loop
- Open-loop controlled pump — Basic commissioning for a pump without control loop
- Closed-loop controlled pump — Basic commissioning for a pump with control loop
- Open-loop controlled compressor — Basic commissioning for a compressor without control loop
- Closed-loop controlled compressor — Basic commissioning for a compressor with control loop
- Roller conveyor — Basic commissioning for roller conveyors

Note

Restoring to the factory setting during commissioning

As a first step in the basic commissioning, the Wizard offers "Restore factory setting". This option is always practical if, under certain circumstances, your Control Unit was used in other applications and you are not completely certain which settings were made at the CU.

Changing numerical values from the IOP

Numerical values are changed digit-by-digit in the IOP. The presently selected digit is changed by turning the navigation wheel and is accepted by pressing OK; the next digit (to the right) is selected at the same time. Every numerical value must be accepted digit by digit by pressing OK, even if a value is not changed.

The display jumps to the next numerical value if the last digit of a number is accepted with OK.

The ESC key can be used to jump back to the previous value if an incorrect value is entered.

Once basic commissioning has been completed, a summary of the settings is provided under the title "Summary of settings". Using the navigation wheel, scroll in this screen until "Continue". If you acknowledge this with OK, you change into a screen that allows you to select either "Save" or "Cancel Wizard". If you press Save, your settings are saved in a non-volatile fashion and the "Settings saved successfully" message is displayed. Acknowledge this message with OK. Then, when switching-on for the first time, depending on the entries you made, the motor data identification is performed or the motor rotates corresponding to the values that have been set.

After the basic commissioning, you can additionally set a voltage boost for starting and a PID controller using the following Wizards.

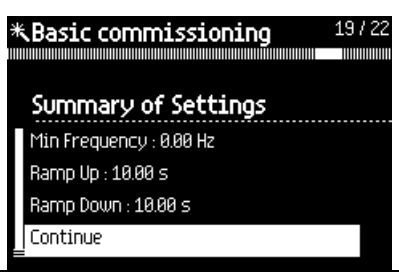
- Boost — Voltage boost
- PID Wizard — PID controller

4.3.2 Commissioning example for inverter operation via terminals

Basic commissioning for inverter operation via terminals - example ON/OFF via digital input 0, setpoint via analog setpoint or fixed frequencies, no supplementary setpoint

Commissioning using the "Basic commissioning" Wizards is executed in the subsequently listed steps:

The steps to enter the setpoint via an analog input are selected to the right in the table under 1; those steps that are required to enter a setpoint via fixed frequencies are listed under 2.

Commissioning step	Type	1	2
Restoring the factory settings (**Yes** / No) - select and confirm with OK	**Selection**	X	X
Control mode: Selection options under various open-loop and closed-loop control variants - select and confirm with OK	**Selection**	X	X
Encoder: Control Unit does not support an encoder - confirm with OK	**Information**	X	X
Encoder pulses, input not possible - confirm with OK	**Information**	X	X
Motor data (switch over to HP and 60 Hz line frequency not supported for this inverter) -> confirm with OK	**Information**	X	X
Characteristic(**50 Hz** / 87 Hz) confirm with OK	**Selection**	X	X
Motor must be connected in the star configuration - confirm with OK	**Information**	X	X
Rated motor output	**Setting**	X	X
Rated motor speed	**Setting**	X	X
Rated motor current	**Setting**	X	X
Rated motor voltage	**Setting**	X	X
Motor data identification (none / calculate all parameters at standstill / calculate all parameters plus saturation curve (motor rotating)) Caution: It is not permissible to predict the direction of rotation and speed. This is the reason that it must be decided on the system side as to whether this type of motor data identification can be selected!	**Selection**	X	X
Select command source "**Terminal**" , confirm with OK	**Selection**	X	X
Select main setpoint source "**Analog setpoint**" , confirm with OK	**Selection**	X	
Select main setpoint source "**Fixed frequency**" , confirm with OK	**Selection**		X
Supplementary setpoint source (for the example, select "No additional setpoint") confirm with OK	**Selection**	X	X
Minimum speed	**Setting**	X	X
Ramp-up time	**Setting**	X	X
Ramp-down time	**Setting**	X	X
"Summary of settings". Select "**Continue**", confirm with OK Note If you select another item in this menu and confirm with "OK", then the Wizard brings you to this point in the basic commissioning and the commissioning steps are run through once again from this point onwards. 	**Selection**	X	X
Select "**Save**", confirm with OK	**Selection**	X	X
The data save progress is displayed using a progress bar. Acknowledge the "Settings saved successfully" message with OK. Confirm the following screen display for motor data identification with OK.		X	X

Commissioning step	Type	1	2
Setting values for the fixed frequencies In order to enter a setpoint via the fixed frequencies, you must now assign digital inputs DI3, DI4 and DI5 to frequencies. You can switch-in the fixed frequencies either individually or together (the values are added). To set the fixed frequencies, go the menu by selecting "Menu / Parameter / Search by number" to select individual parameters. There, select parameter p1001 (enter 01001). Select the parameter with OK, with an additional OK, change into the value level and enter the required value using the navigation wheel and confirm this with OK. Select and change parameters p1002 and 1003 one after the other (factory setting = 0). After making the setting, press the ESC key until you reach the status display. The value in p1001 is the fixed frequency for DI3, p1002 for DI4, p1003 for DI5.	Selection		X
If you did not select motor data identification, then commissioning has now been completed and you can start the motor by issuing an ON command. If you have selected a variant of the motor data identification, then this is started with the next ON command. In this case, commissioning has been completed after the motor data identification.	Information	X	X

Note

If you do not make an entry for longer than 60 seconds, the IOP exits the Commissioning Wizards and returns to the status display with the settings that you have made.

4.4 Restoring the factory settings using the IOP

The inverter is reset to the delivery condition by restoring the parameters to the factory setting.

Note

The reset operation is not applied to parameters p0014, p0100, p0201, p0205 or the communication parameters. Motor parameters p0300 ... p0311 are suitably preassigned for the power unit.

Reset is selected using the navigation wheel on the IOP via "Menus/Parameters/Restore drives to factory setting" and then started by pressing "OK".

After the reset, the display first jumps into the parameter window from where the reset was started. You can return to the status display by pressing the "ESC" key twice.

4.5 Additional setting options for the inputs and outputs

Adapting the functions of the input and output terminals

The functions of the individual terminals can be adapted using interconnection and adjustable parameters. The number ranges for the individual inputs and outputs are subsequently listed. In the IOP, you can call the individual parameters via "Menu/Parameter/Search by number" and then you will obtain information texts by pressing the "INFO" button.

Parameters to change the functions of the inputs and outputs

- Digital inputs: p0701 to p0724
- Digital outputs: p0730 to p0748
- Analog inputs: r0751 to p0762
- Analog outputs: p0771 p0785

If you use Starter, then you can make the changes using the "Inputs and outputs" menu.

5 Technical data

Characteristic	Data
Operating voltage	24 V DC from the Power Module or an external 24 V DC supply (20.4 V to 28.8 V, 0.5 A) over control terminals 31 and 32
Open-loop/closed-loop control procedure	V/f control, output frequency between 0 Hz and 650 Hz: • Linear V/f control, • Linear V/f control with FCC, • Linear V/f control with ECO mode, • Quadratic V/f control, • Multipoint V/f control, • V/f control for applications in the textile industry, • V/f control with FCC for applications in the textile industry, • V/f control with independent voltage setpoint, Vector control, output frequency between 0 Hz and 200 Hz: • Speed control without encoder • Torque control without encoder
Fixed frequencies	16, parameterizable
Skip frequencies	4, parameterizable
Setpoint resolution	0.01 Hz digital; 0.01 Hz serial; 10 bit analog (motorized potentiometer 0.1 Hz [0.1% in PID mode])
Digital inputs (dependent on the CU type)	Up to 6 digital inputs, isolated; SIMATIC-compatible, Low < 5 V, High > 10 V, maximum input voltage 30 V, switchable via terminals - PNP Jumper terminal 69 with terminal 9 - NPN: Jumper 69 with terminal 28, **Notice!** Either PNP or NPN must be jumpered in order that the inverter can function
Analog inputs	• 2 switchable (current/voltage), both configurable as additional digital inputs. 0 V to 10 V, 0 mA to 20 mA and -10 V to +10 V (AI0) 0 V to 10 V and 0 mA to 20 mA (AI1) • 1 switchable (current / Ni1000) (AI2) 0/4 mA … 20 mA NI1000: - 50°C … 150 °C PT1000: - 50 °C … 250 C • 1 fixed (NI1000, PT1000) (AI3) NI1000: - 50°C … 150 °C PT1000: - 50 °C … 250 C
Relay outputs	3, parameterizable • DO1: 30 V DC / 0 A to 5 A (resistive load), 250 V AC / 2 A • DO2: 30 V DC / 0 A to 0,5 A (resistive load) • DO3: 30 V DC / 0 A to 5 A (resistive load), 250 V AC / 2 A
Analog outputs	2, parameterizable: 0 mA … 20 mA, 0 V … 10 V (AO0, AO1)
Dimensions (WxHxD)	73 mm x 199 mm x 65.5 mm
Weight	0.61 kg
Operating temperature	- 10°C … +60 °C (possible restrictions as a result of the Power Module should be observed)
Storage temperature	- 40°C … +70 °C
Humidity	< 95 % RH, non-condensing

Note

As far as the environmental requirements are concerned, possible restrictions resulting from the permissible values for the power module must be taken into account.

The control terminals on the Control Unit are galvanically isolated from the supply voltage (PELV).

6 Diagnostics

Options to display the state

Extraordinary inverter states are displayed using fault and alarm messages. An overview of all of the possible alarms and faults is provided in Chapter 3 of the list manual.

The inverter provides the following options to display the state:

- **LED** - via the Control Unit
  You will find details in the next section.
- **Alarm and fault numbers** via IOP and STARTER
  You will find detailed descriptions on the alarm and fault numbers in the corresponding online help or in the List Manual.
- **Diagnostic parameters** via a control
  Fault display on a higher-level control system

6.1 Operating states indicated on LEDs

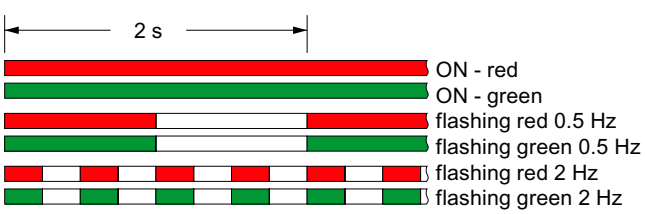
Operating states of the Control Unit displayed by LEDs

The Control Unit is equipped with two LEDs, RDY (Ready) and BF (Bus Fault) that display the inverter status by showing a red or green steady or flashing light.

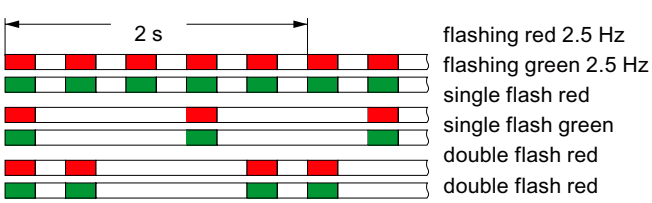
There are two main inverter states, i.e. power-up and operation.

- **Power-up**
  During power-up, the inverter progresses through various states which are indicated by red flickering or flashing for brief periods by the Ready and the Bus Fault LEDs. It is not possible to read the inverter's current state from these displays.
- **Operation**
  The relevant inverter state in operation is displayed by the LED states described below.

Possible LED states



LED displays for inverter and communication



Additional status displays for the operator panel LED for CANopen

Table 4 LED display of inverter states

LED		Explanation
RDY	BF	
ON - green	---	Ready for operation (no active fault)
2 Hz - red	---	General fault
0.5 Hz - green	OFF	Commissioning/reset to factory settings

Table 5 LED status display for communication over PROFIBUS DP

BF LED	Explanation
OFF	Cyclic data exchange (or PROFIBUS not used, p2030 = 0)
0.5 Hz - red	Bus fault - configuration error
2 Hz - red	Bus fault - no data exchange - baud rate search - no connection

Table 6 LED status display for communication via RS485 (USS and Modbus RTU)

BF LED	Explanation
OFF	Receive process data
0.5 Hz - red	Bus active - no process data
2 Hz - red	No bus activity

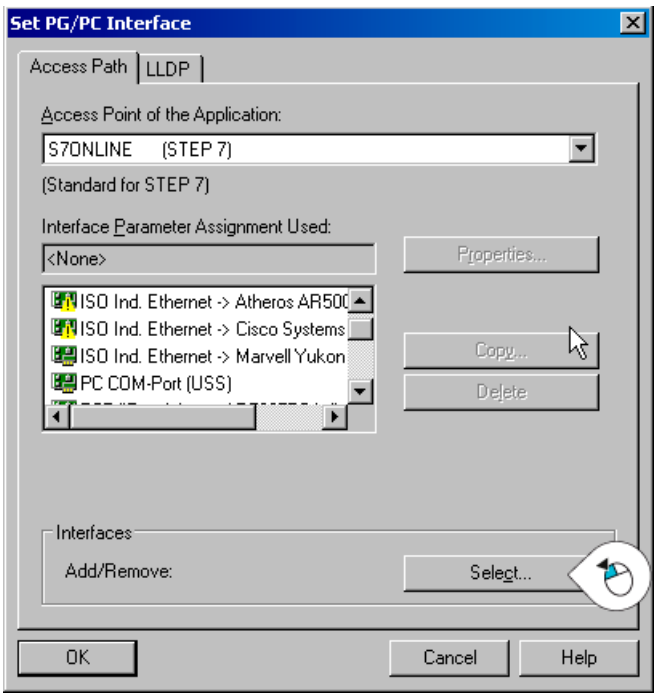
Table 7 LED status display for communication over CANopen

BF LED	Explanation
ON - red	No bus
ON - green	Bus state "Operational"
2.5 Hz - green	Bus state "Pre-Operational" (flashing)
Single flash - green	Bus state "Stopped"
Single flash - red	Alarm - limit reached
Double flash - red	Error event in control (Error Control Event)

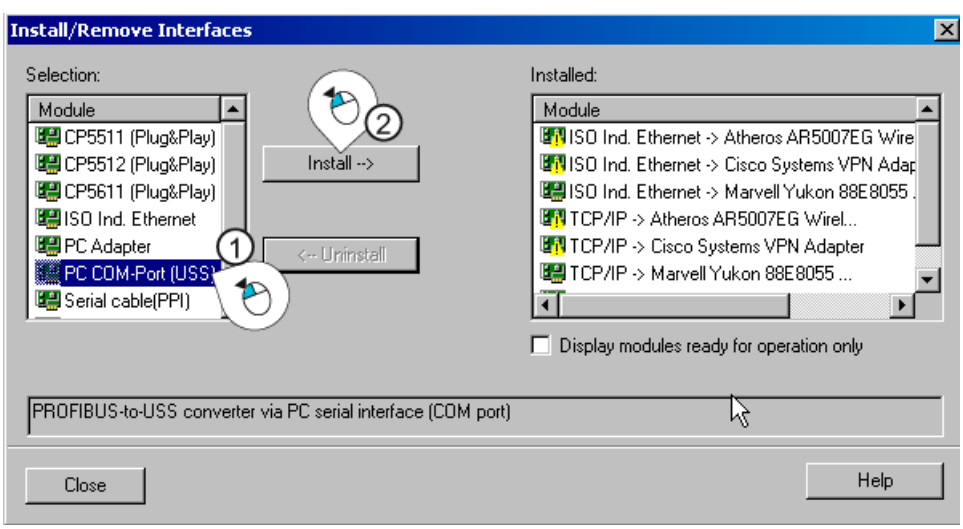
7 Appendix

7.1 Installing the COM interface

Install the interface as shown in the following dialog screen forms.



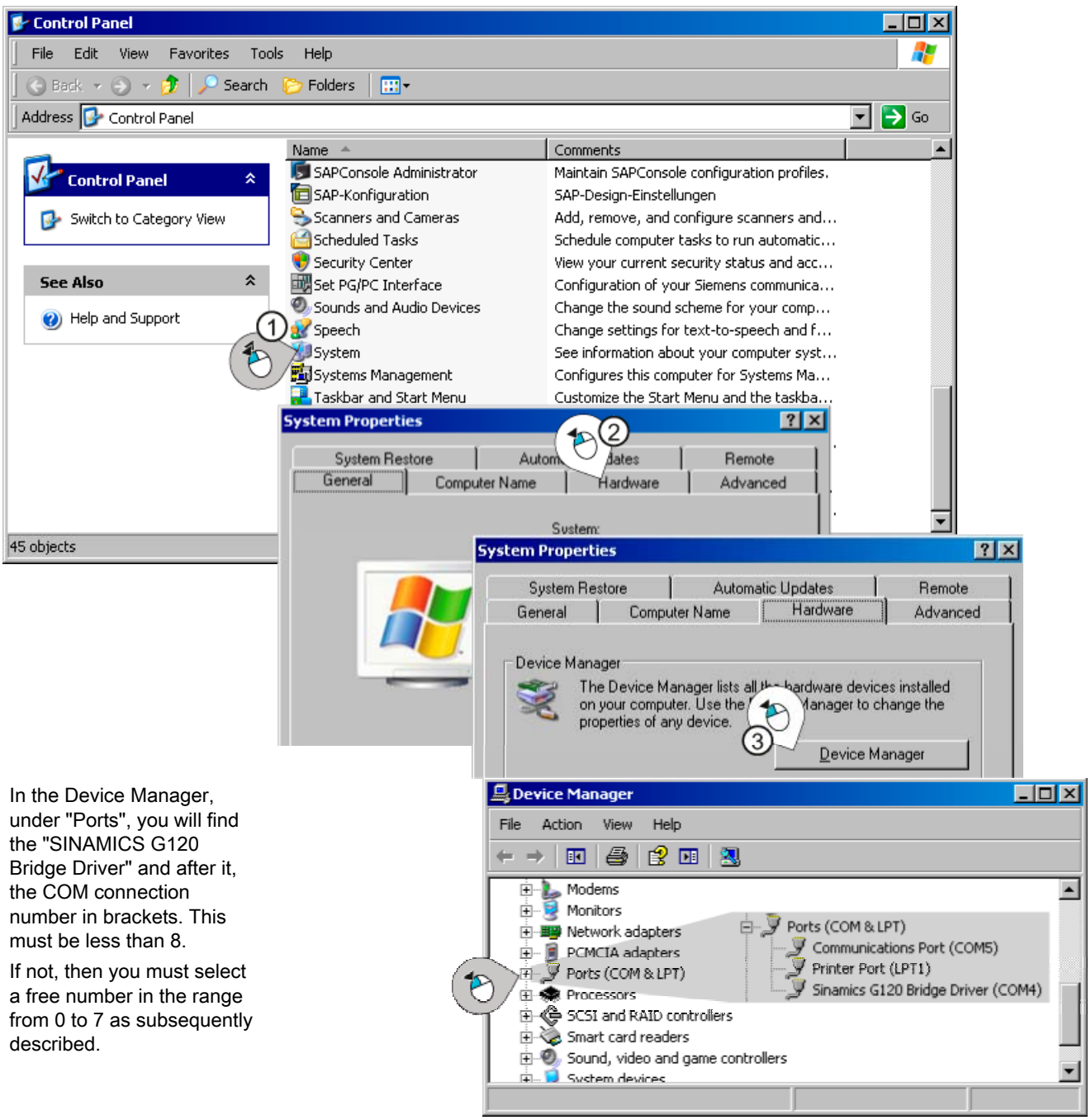
After completing the installation, close the window and proceed with the configuration of the COM interface.



7.2 Setting the COM interface

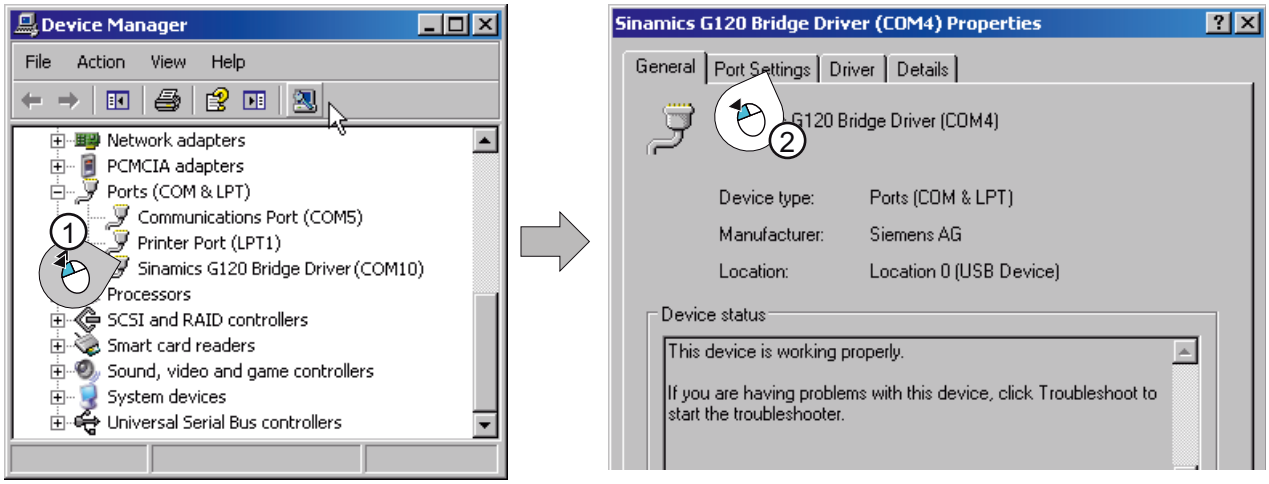
Setting the COM interface

You can find, and if required, change the COM interface from the control panel as subsequently described.



In the Device Manager, under "Ports", you will find the "SINAMICS G120 Bridge Driver" and after it, the COM connection number in brackets. This must be less than 8.

If not, then you must select a free number in the range from 0 to 7 as subsequently described.



As described here, open the "Connection settings" tab in the Properties window of the driver.

There, click on "Extended ..." therefore opening the "Extended settings" screen form. In this screen form, select a free COM connection number < 8. Acknowledge this screen form and the properties window of the driver without making any changes with OK and then close the Device Manager and the Control Panel.

You require the number of the COM interface to set the PC interface.

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